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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/992,844	11/14/2001	Bruno Scherzinger	APP2-BM45	7250

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EXAMINER
LE, TOAN M

ART UNIT	PAPER NUMBER
2862	

DATE MAILED: 02/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/992,844	SCHERZINGER ET AL.	
	Examiner	Art Unit	
	Toan M Le	2862	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 November 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 1-2, 5-14, and 16-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Reilly et al..

Referring to claim 1-2, Reilly et al. discloses a Land Surveyor System with Reprocessing (LSSRP) comprising: an AINS providing a sequence time-indexed present position values in response to the LSSRP being moved from a first known position value at the start of a survey interval to a second known position value at the end of the survey interval, a Position Computing System (PCS) coupled to receive and store the sequence of time-indexed present position values as the surveyor moves from the first known position to the second known position, the PCS having, a reprocessing computer and program means for processing the indexed present position values with a smoothing algorithm to provide indexed and adjusted present position values for at

least some of the indexed present position values, between the first known position value at the start of the survey interval and the second known position value at the end of the survey interval, wherein the AINS uses a Kalman filter responsive to at least two sources of aiding signals, the PCS having an aiding signal selector algorithm characterized to select the most accurate aiding signal for use by the Kalman filter from all available aiding signals (col. 10, lines 43-63 and 66-67; and col. 11, lines 5-6; figure 11).

Referring to claims 5-6, Reilly et al. disclose the LSSRP wherein the PCS and the AINS are integrally coupled into a package to be carried by a surveyor and wherein the package further comprises an input/output interface device having a means for inputting and time-indexing successive known present position values at respective successive known present position fixes, each successive pair of known present position values establishing the beginning and end of a survey interval, and for signaling the reprocessing computer and program means to run the smoother algorithm using the successive known present position fixes with the indexed present position values obtained during the corresponding past survey interval to provide indexed and adjusted present position values for at least some of the indexed present position values, wherein the input/output interface device having a means for inputting and time-indexing successive known present position values further comprises: a computer key pad and a read-out display electrically coupled to the PCS for inputting successive known present position values and signaling the start of a position fix (col. 10, lines 21-25; figure 13).

As to claims 7-8 and 16, Reilly et al. disclose the LSSRP wherein the PCS coupled to receive and store the sequence of time-indexed present position values further comprises: a mass storage memory for storing the sequence of time-indexed present position values and wherein the

mass storage memory for storing the sequence of time-indexed present position values is linked to the reprocessing computer and program mean by a radio link (figures 10-11).

Referring to claims 9-10 and 17, Reilly et al. disclose the LSSRP wherein the PCS and the AINS are integrally coupled into a package for transport and use by a surveyor, the PCS having a switch means with which the surveyor manually signals the AINS that the unit is stationary and that 4 a ZUPD has started and wherein the switch means further comprises a mechanical closure coupled to the package and electrically coupled to the AINS to signal the start of a ZUPD, the mechanical closure being transferred by operation of a lever or plunger contacting the ground (col. 5, lines 59-65; and col. 11, lines 1-2).

Referring to claim 11, Reilly et al. disclose a Land Surveyor System with Reprocessing (LSSRP) transported by a surveyor moving from a first known position at the start of a survey interval to a second known position at the end of the survey interval, the LSSRP comprising: an Aided Inertial Navigation System (AINS) having a Kalman filter coupled to be responsive to at least a first source of aiding time-indexed values, the AINS providing a continuing sequence of time-indexed present position values, a Position Computing System (PCS) having a program for storing the continuing sequence of time-indexed present position values in a memory and for outputting the time-indexed present position value of the PCS as the surveyor moves from the first known position to the second known position, the surveyor using the output time-indexed present position value to locate at least one predetermined stake position, the PCS further comprising a reprocessing computer and program means activated at the second known position to access and process the stored continuing sequence of time-indexed present position values with a smoothing program to provide indexed and adjusted present position values for at least

some of the continuing sequence of time-indexed present position values, and wherein, the PCS and the AINS are integrally coupled into a package for transport and use by a surveyor, the PCS having a switch means for signaling the AINS that the unit is stationary and that a ZLJPD has started (col. 5, lines 59-65; col. 10, lines 43-63 and 66-67; and col. 11, lines 5-6; figure 11).

As to claims 12-14, Reilly et al. disclose the LSSRP wherein the PCS further comprises an aiding signal selector for analyzing the aiding position signals available to the AINS and for commanding the AINS to select and use the highest accuracy aiding position signal available; wherein the aiding signal selector for analyzing the aiding position signals available to the AINS monitors for loss of differential GPS and in the event differential GPS is lost, the aiding signal selector directs the AINS to not use GPS signals as aiding position signals until differential GPS is restored; and wherein the aiding signal selector is further characterized to receive all aiding position signals and to select and the highest accuracy aiding position signal for use provide the highest accuracy aiding position signal to the AINS for use as an input to a Kalman filter (col. 6, lines 57-67; col. 7, lines 1-6 and 15-19).

Referring to claims 18-20, Reilly et al. disclose a Land Surveyor System with Reprocessing (LSSRP) process comprising the steps of: providing an AINS and programming the AINS to provide a sequence time-indexed present position values in response to the LSSRP being moved from a first known position value at the start of a survey interval to a second known position value at the end of the survey interval, providing a Position Computing System (PCS) and directing and coupling the PCS to receive and store the sequence of time-indexed present position values as the surveyor moves from the first known position to the second known position, providing a reprocessing computer and running a reprocessing program to process the

indexed present position values with a smoothing algorithm, providing indexed and adjusted present position values for at least some of the indexed present position values to correct the position of at least one stake, between the first known position value at the start of the survey interval and the second known position value at the end of the survey interval, wherein the step of providing an AINS further comprises the steps of: providing at least two sources of aiding signals to a Kalman filter in the AINS, providing an aiding signal selector, the aiding signal selector running an algorithm characterized to select the most accurate aiding signal for use by the Kalman filter from all available aiding signals; and further comprising the step of programming the reprocessing computer and program means to run a smoothing algorithm program, the program processing the indexed present position values to provide indexed and adjusted present position values for at least some of the indexed present position values (col. 7, lines 1-6 and 15-19; col. 10, lines 43-63 and 66-67; and col. 11, lines 5-6; figure 11).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3-4 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reilly et al. in view of "The Estimation and Control of Terrestrial Inertial Navigation System Errors Due to Vertical Deflections", Nash (Referring hereafter Nash).

Referring to claims 3-4 and 15, Reilly et al. discloses a Land Surveyor System with Reprocessing (LSSRP) comprising: an AINS providing a sequence time-indexed present position values in response to the LSSRP being moved from a first known position value at the start of a survey interval to a second known position value at the end of the survey interval, a Position Computing System (PCS) coupled to receive and store the sequence of time-indexed present position values as the surveyor moves from the first known position to the second known position, the PCS having, a reprocessing computer and program means for processing the indexed present position values with a smoothing algorithm to provide indexed and adjusted present position values for at least some of the indexed present position values, between the first known position value at the start of the survey interval and the second known position value at the end of the survey interval, wherein the AINS uses a Kalman filter responsive to at least two sources of aiding signals, the PCS having an aiding signal selector algorithm characterized to select the most accurate aiding signal for use by the Kalman filter from all available aiding signals (col. 10, lines 43-63 and 66-67; and col. 11, lines 5-6; figure 11).

Reilly et al. do not disclose a Land Surveyor System with Reprocessing (LSSRP) wherein the reprocessing computer and program means smoothing algorithm to provide indexed and adjusted present position values for at least some of the continuing sequence of time-indexed present position values is a Modified Bryson-Frazier smoother (MBFS) and wherein the reprocessing computer and program means smoothing algorithm is a modified Bryson-Frazier smoother (MBFS) mechanized using the following equations and definitions for steps and definitions: data available to the MBFS at iteration k from the AINS-LSSRP Kalman filter:

$\Phi(k; k-1)$ transition matrix from iteration k-l to iteration k,

H_k measurement matrix,

K_k Kalman gain,

S_k Kalman innovations covariance,

ξ_k innovations vector,

x_k^- x_k^+ Kalman estimated error state

P_k^- P_k^+ Kalman generated estimation error VCV matrix,

and where,

the backwards extrapolation follows:

$$\lambda^+_{k-1} = \Phi^T(k : k-1)\,\lambda^-_k$$

$$\Lambda^+_{k-1} = \Phi^T(k : k-1)\,\Lambda^-_k\ \Phi(k : k\text{-}1),$$

and the adjoint measurement update follows:

$$\lambda^-_k = (I - H_k K_k)\,\lambda^+_k - H_k\,S^{-1}_k\,\xi_k$$

$$\Lambda^-_k = (I - H_k K_k)^T\,\Lambda^+_k\,(I - H_k K_k) + H^T_k\,S_k H_k,$$

and where:

λ^-_k is the a priori adjoint state vector,

Λ^-_k is the a priori adjoint VCV matrix,

λ^+_k is the a posteriori state vector, and

Λ^+_k is the a posteriori adjoint VCV matrix;

and where:

the smoothed state and estimation error VCV matrix is defined by:

$$x_k^s = x_k^- - P^-_k\,\lambda^-_k = x_k^+ - P^+_k\ \lambda^+_k$$

$$P^s_k = P^-_k\,(I - \Lambda^-_k\,P^-_k) = P^+_k\ (I - \Lambda^+_k\,P^+_k)$$

and where the smoothed state vector is defined by:

$x_k^s = [\ \delta r_s\ \ x^s_{remaining}\ ]$

where δr_s is the smoothed estimate of AINS position error and

$x^s_{remaining}$ is the sub-vector of smoothed error states other than δr_s

and where the AINS position vector r^e_s is obtained from the error correction difference matrix (20) using earth fixed Cartesian coordinates (X,Y,Z components) as

$r^e_s = r^e_k - \delta r_s$

Nash discloses a Land Surveyor System with Reprocessing (LSSRP) wherein the reprocessing computer and program means smoothing algorithm to provide indexed and adjusted present position values for at least some of the continuing sequence of time-indexed present position values is a Modified Bryson-Frazier smoother (MBFS) and wherein the reprocessing computer and program means smoothing algorithm is a modified Bryson-Frazier smoother (MBFS) mechanized using the following equations and definitions for steps and definitions: data available to the MBFS at iteration k from the AINS-LSSRP Kalman filter (pages 334-336, section IV).

Accordingly, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have applied the Modified Bryson-Frazier smoothing algorithm (MBFS) as described in the Nash reference into the system of Reilly et al. to reduce errors due to vertical deflections or drifts in the inertial sensors to improve accuracy in the survey.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent No. 5,956,660 to Neumann U.S. Patent No. 6,401,036 to Geier et al.

These Patents disclose a land survey system.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Toan M Le whose telephone number is (703)305-4016. The examiner can normally be reached on Monday through Friday from 9:00 A.M. to 5:30 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Lefkowitz can be reached on (703)305-4816. The fax phone numbers for the organization where this application or proceeding is assigned are (703)872-9318 for regular communications and (703)872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)305-0956.

Toan Le

February 4, 2003

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